portion of the transmission could eventually be reclaimed for other uses once ATV reaches a certain level of penetration.

C. Additional 6 MHz Option For Either An Augmentation Signal Or For A Dual Non-Compatible ATV Signal

The major advantage of adopting an ATV standard that allows for 6 MHz of additional spectrum usage for augmentation is the impact on picture resolution and sound quality. The major disadvantage of this approach is the amount of spectrum that would be consumed. The spectrum demands could be mitigated somewhat, if encoding, picture element sampling and modulation techniques currently under development permit more efficient use of the available broadcast spectrum. In that case, UHF and VHF spectrum which is now unavailable because of separation requirements and taboos may become usable. Spectrum-efficient encoding, and modulation schemes also may allow ATV augmentation signals to be satisfactorily transmitted through cable systems at lower power levels. As with the 3 MHz augmentation option, the 6 MHz augmentation option would require the stitching together of two separately received signals to form a complete picture. It is not known, at this time, whether this will present a problem in any of the ATV systems that use this technique.

In the alternative, providing 6 MHz of additional spectrum through which broadcasters can simulcast a non-compatible ATV signal may have some advantages over the augmentation approach. First, 6 MHz systems that are not bound by the NTSC standard may be able to utilize various techniques to increase the amount of information that can be transmitted through that bandwidth.

Moreover, if the audio information is digitized and transmitted during blanking intervals, additional spectrum becomes available for picture information. Furthermore, the simulcast option has the advantage of not requiring that the additional spectrum be in the same band as the NTSC signal, i.e. the signals do not have to be contiguous. Finally, as noted above, in the long term, this option could be more efficient when the NTSC spectrum is recovered after the transition period.

The adoption of a simulcast approach, however, has definite ramifications for cable carriage of broadcast signals. For example, if a cable system carries 7-10 channels of broadcast programming, simulcasting could mean occupying 14-20 channels of capacity to deliver the same amount of programming to subscribers. Moreover, simulcasting likely would result in overall reductions in program diversity.[12/] Since cable is foremost a consumer-driven industry, the question becomes do consumers want to bear the cost of duplicative broadcast channels?[13/] In some instances, they might accept the cost and in some instances, they might not. The point is that cable operators will have to be cognizant of subscriber reaction to simulcasting and will ultimately have to be responsive to their desires. The Commission and the broadcast industry cannot, therefore, simply

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12/ Few cable systems have substantial segments of unused capacity at almost any given point in time.

13/ This question might evoke different responses as ATV receivers become more commonplace, but initially consumer response might be particularly negative.

assume that a simulcast approach that essentially places the burden on cable is an easy fix to the problem of bridging the transition from NTSC to ATV.

Nevertheless, since there are apparent advantages to a simulcast approach that merit careful consideration, it would be unwise to rule out this option at this time. Advanced television systems, such as the one proposed by Zenith, warrant time for adequate development and evaluation.[14/]

VI. ATV SYSTEMS WHICH REQUIRE MORE THAN 6 MHz OF SPECTRUM WILL PUT SIGNIFICANT PRESSURE ON CABLE RELAY OPERATIONS, PARTICULARLY IN CONGESTED URBAN AREAS.

The microwave spectrum allocated to cable television for relay service, known as CARS, is essential to cable's ability to retransmit broadcast signals and satellite-delivered programming. As recognized by the Commission, the successful implementation of a wideband ATV system may depend upon modification of the existing signal delivery systems. Indeed, it is quite evident that at its present and projected level of use, the CARS band will be severely strained by the transmission of advanced television systems that require more than 6 MHz of spectrum.

Cable systems currently have access to the 12, 18 and 23 GHz bands for CARS operations. The 12 GHz band, which has the most

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14/ The Zenith simulcast proposal promises to significantly reduce power requirements by suppressing the visual carrier, digitizing the low frequency information and digitizing the audio information. These three elements of a television signal account for the vast majority of transmitted power. Additionally, it appears that the Zenith system will produce a rugged enough signal to survive both terrestrial broadcast and cable transmission.

optimal transmission conditions of the three bands, is the most heavily used for cable microwave relay service. It is capable of accommodating up to 84 6 MHz NTSC television channels. However, cable systems today are generally distributing up to 50 NTSC channels, and this number continues to increase with technological developments and plant modernization. Thus, if future ATV service requires additional spectrum, the 12 GHz band will be insufficient for the retransmission of a significant number of ATV signals.

Although the higher microwave frequencies at 18 and 23 GHz are also available to cable relay stations, they have not been fully exploited because their shorter path lengths make them more susceptible to picture-impairing environmental factors (i.e., precipitation-induced fades). To alleviate the attenuation problems at these frequencies, cable systems would have to install equipment at shorter intervals, including new microwave hubs and new coaxial distribution plant. In addition, transmitter power would have to be substantially increased at a significant cost because of the path loss. Problems with alignment of antennas would also arise because of smaller beamwidths at the higher frequencies. All in all, the amplitude-modulated equipment required for cable transmission in these bands is significantly more costly than the 12 GHz equipment. Furthermore, it is still largely undeveloped.

In light of the effectiveness of the 12 GHz band and the transmission problems associated with the 18 and 23 GHz bands,

the cable industry has generally not utilized the higher frequencies for CARS facilities. Moreover, cable operators are likely to continue to use the 12 GHz band given the highly evolved state of the equipment and the substantial investment and difficult transition that would be required to migrate to the higher frequencies.

In the Further Notice, the Commission seeks information on the mechanisms cable can employ to accommodate wider bandwidth ATV signals either within the existing CARS band or through other alternatives. As noted above, the existing allocation for CARS, particularly in already congested urban areas, is inadequate for signals requiring spectrum greater than 6 MHz. Thus, the cable industry's ability to provide ATV service would benefit most from the expansion of available frequencies within the 12 GHz band.[15/] This would permit cable systems to continue to use existing equipment by merely expanding their capability at the upper end of the band. However, assuming that no additional frequencies are allocated in this band, the likely alternative is the instal-

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15/ In some limited situations, the industry has stretched the amount of information that can be transmitted within one channel by utilizing a dual polarization technique. However, this technique does not appear to be feasible for the transmission of the additional information necessary for ATV. First, the relatively low isolation of 25 dB that is achieved with this technique will require co-location of transmitters sharing a channel and a high level of correlation between the two signals. Secondly, the performance level would be further limited by precipitation. Finally, broadband amplitude modulated microwave links may not support ATV signals that occupy more than 6 MHz because of intermod products that are generated.

lation of fiber optic interconnections or co-axial cable super-trunks as a means to expand transmission capacity. As noted previously, although the transmission technique most suitable for fiber has yet to be determined (and will depend on its ability to work with the various modulation formats), it is likely that in the long term fiber optic technology will be widely utilized by cable. For the immediate future, however, wideband ATV service will require some modification of the CARS allocation scheme.

CONCLUSION

For the foregoing reasons, the Commission should refrain from adopting any standards for transmission of advanced television until the systems undergo adequate testing and the industries arrive at common ground on compatibility matters. In setting future standards, the Commission should also require that the broadcast ATV system work effectively and efficiently over cable.

Respectfully submitted,

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